

INTERNATIONAL SEARCH REPORT

international application No

US 2005/038017

A CLASSIFICATION SUBJECT MATTER
C08C 19/44 C08C19/30 C08L19/00

According to International Patent Classification (IPC) or to both national classification and IPC

B FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols¹⁾
C08C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and where practical search terms used)

EPO-Internal , WPI Data

C DOCUMENTS CONSIDERED TO BE RELEVANT

Category ²⁾	Citation of document with indication where appropriate of the relevant passages	Relevant to claim No
X	EP 1 449 857 A (BRIDGESTONE CORPORATION) 25 August 2004 (2004-08-25)	1-17, 20
Y	* preparation example 4 * * table 1-4 * abstract; claims -----	18, 19
X	EP 1 319 673 A (BAYER AG) 18 June 2003 (2003-06-18) abstract, claims page 5, line 29 - line 40 -----	1-17, 20
X	EP 1 457 501 A (JSR CORPORATION) 15 September 2004 (2004-09-15) abstract; claims page 10, line 18 - page 11, line 30 ----- -/-	1-3, 7-16

Further documents are listed in the continuation of Box C

See patent family annex

* Special categories of cited documents

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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No
X	EP 0 890 607 A (COMPAGNIE GENERALE DES ETABLISSEMENTS MICHELIN-MICHELIN & CIE) 13 January 1999 (1999-01-13) abstract; claims -----	1,3,7, 9-16
Y	EP 0 745 614 A (DOW CORNING CORPORATION) 4 December 1996 (1996-12-04) abstract; claims; examples -----	18,19

INTERNATIONAL SEARCH REPORT

information on patent family members

International application No

'US2005/038017

Patent document cited in search report	Publication date	Patent family member(s)			Publication date
EP 1449857	A 25-08-2004	CN WO US	1592760 03046020 2005070672	A AI AI	09-03-2005 05-06-2003 31-03-2005
EP 1319673	A 18-06-2003	BR CA JP MX US	0205159 2414045 2003192723 PA02012259 2003125476	A AI A A AI	20-07-2004 12-06-2003 09-07-2003 12-12-2003 03-07-2003
EP 1457501	A 15-09-2004	CA CN WO US	2461259 1578790 03029299 2004254301	AI A AI AI	10-04-2003 09-02-2005 10-04-2003 16-12-2004
EP 0890607	A 13-01-1999	AT AU AU BR CA CN DE DE ES FR JP US	235535 741051 7509298 9802398 2241793 1210119 69812486 69812486 2191223 2765882 11080514 5977238	T B2 A A AI A D1 T2 T3 AI A A	15-04-2003 22-11-2001 21-01-1999 29-06-1999 11-01-1999 10-03-1999 30-04-2003 18-12-2003 01-09-2003 15-01-1999 26-03-1999 02-11-1999
EP 0745614	A 04-12-1996	DE DE JP US	69600746 69600746 8325324 5561210	D1 T2 A A	12-11-1998 10-06-1999 10-12-1996 01-10-1996

AMENDED CLAIMS
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We claim:

1. A method of making an amine-functionalized polymer, comprising:
 - a) in a reaction medium, reacting a living polymer with a cyclic compound comprising at least one siloxane unit in its ring structure so as to provide an intermediate functionalized living polymer;
 - b) introducing into said reaction medium an amine comprising an active hydrogen atom attached to the amino nitrogen atom of said amine and allowing said amine to chemically bond to said intermediate functionalized living polymer,
thereby providing said amine-functionalized polymer.
2. The method of claim 1 wherein said cyclic compound comprises at least three siloxane units in its ring structure.
3. The method of claim 2 wherein said ring structure of said cyclic compound consists of silicon and oxygen atoms.
4. The method of any of claims 2 to 3 wherein at least one of the silicon atoms of said cyclic compound comprises at least one C₁-C₆ substituent.
5. The method of any of claims 2 to 3 wherein each of the silicon atoms of said cyclic compound comprises at least one C₁-C₃ alkyl group.
6. The method of claim 5 wherein said cyclic compound is hexamethylcyclotri-siloxane or octaniethylcyclotetrasiloxane.
7. The method of any of claims 1 to 6 further comprising the step of providing said living polymer via anionic solution polymerization.

8. The method of claim 7 wherein said polymer is a substantially random interpolymer comprising mer units derived from one or more vinyl aromatics and one or more polyenes.
9. A functionalized polymer comprising an elastomer, a terminal functional group comprising at least two different heteroatoms and, intermediate said elastomer and said functional group, at least three siloxane units.
10. The functionalized polymer of claim 9 wherein each silicon atom in each of said siloxane units is substituted with C1-C3 alkyl groups.
11. The functionalized polymer of any of claims 9 to 10 wherein said functional group comprises a primary or secondary amino group.
12. The functionalized polymer of any of claims 9 to 11 wherein said functional group comprises siloxane functionality.
13. The functionalized polymer of any of claims 9 to 10 wherein said functional group comprises a halogen atom.
14. The functionalized polymer of any of claims 9 to 10 wherein said functional group is a sultone.
15. The functionalized polymer of any of claims 9 to 14 wherein said siloxane units are derived from a polysiloxane.
16. The functionalized polymer of claim 15 wherein said polysiloxane is hexamethylcyclotrisiloxane or octamethylcyclotetrasiloxane.
17. The functionalized polymer of any of claims 9 to 16 wherein said elastomer is a substantially random interpolymer comprising mer units derived from one or more vinyl aromatics and one or more polyenes.

18. The functionalized polymer of claim 17 wherein said elastomer is an interpolymer of styrene and butadiene.
19. The functionalized polymer of claim 18 wherein said interpolymer comprises from 20 to 35% by weight mer units derived from styrene.
20. The functionalized polymer of any of claims 18 to 19 wherein said interpolymer has a 1,2-microstructure of from 25 to 65% .